Final Report—Pilot Study of Class III Watercourses for the Hillslope Monitoring Program

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INTRODUCTION

Hillslope monitoring is being conducted by the Board of Forestry and Fire Protection (BOF) and the California Department of Forestry and Fire Protection (CDF) to evaluate the implementation and effectiveness of the Forest Practice Rules (FPRs) in protecting water quality.

Class III watercourses are generally ephemeral streams that flow in response to rainfall and have the potential to store and transport sediment. They are one of the primary physical links between disturbed soil on the hillslope and Class I and II streams downslope. Recently, there has been increasing interest in the protection of Class III watercourses. Part of the current interest stems from the protection measures required in the PALCO HCP/SYP. New FPRs for Class III watercourse protection have recently been approved—and more are being considered.

Hillslope monitoring conducted during 1996, 1997, and 1998 did not include a sampling of Class III watercourses. The BOF Monitoring Study Group has recognized this potentially significant shortcoming since 1995.

This report contains the results of a pilot study that was added to the 1999 Hillslope Monitoring Program work to develop a methodology for evaluating the effectiveness of FPRs related to Class III watercourses. The methods, procedures, form revisions, and analytic techniques developed by the study fill an increasingly important monitoring gap. This methodology will allow an evaluation of the need for new FPRs and of the need for better enforcement of existing FPRs to protect water quality and fish habitat. The methodology developed by this pilot study should be incorporated into the Hillslope Monitoring Program.

BACKGROUND

Sediment delivery to and transport within the upper reaches of the channel network strongly influence downstream habitat conditions (Forest Ecosystem Management Assessment Team 1993). Riparian protection for headwater channels is important because sediment stored in these channels attenuates delivery of high sediment loads to downstream reaches (Montgomery 1998).

Equipment Limitation Zones (ELZs) along Class III watercourses reduce direct impacts to Class III channels, but they do not address the indirect effects of logging on Class III watercourses by the removal of large woody debris (LWD).

LWD can be a significant sediment storage element in headwater channels. Depletion of LWD through either direct removal or reduced recruitment can reduce the amount of sediment stored in headwater channels, and thereby increase sediment delivery to downstream portions of the channel network (O'Conner and Harr 1994).

It is important to maintain a supply of stable (i.e. large diameter) woody debris in Class III streams. In addition to attenuation of sediment, the upper reaches of Class III watercourses are often the sites of unstable headwall swales that produce landslides (Reid 1998).

There are several reasons why Class III watercourses were not evaluated during the Pilot Monitoring Program and during hillslope monitoring conducted in 1996-98. Methods to evaluate sediment movement through small ephemeral channels are poorly defined; hydrologic processes affecting Class III channels vary across California; and, a comprehensive analysis of Class III watercourses was thought to require a drainage-wide perspective to assess the impacts of roads, skid trails, and yarding upon drainage, channel capture, gullying, recruitment of large woody debris. In 1955, it was felt that this would require a research effort beyond the capability of the Pilot Monitoring Program or the long-term monitoring program (Tuttle 1995).

FIELD METHODS

The pilot study was conducted during the course of regular hillslope monitoring conducted on 47 THPs during the summer of 1999. It included the following phases: (1) on each THP sampled, a short traverse was made of a Class III watercourse; this was followed by a group/team discussion and brainstorming session to develop a list of issues, features, and potential sampling methods for Class III watercourses; (2) a draft field form was developed; and (3) Class III watercourses were transected and data collected using the draft form. Data will be entered into the HMP database after the database has been appropriately modified.

Mid-slope transects were made parallel to Class III watercourses using the methodology for Class I and II WLPZs. Where a WLPZ or ELZ was designated, the transect was located along the mid-point of the designated zone. Where no protection zone was designated, the transect was located approximately 25 feet from the watercourse. Sideslope gradient, ground cover, and WLPZ width were recorded at the beginning and end points of the transect and at 100 foot intervals. Other features were noted as they occurred. Canopy cover was not measured, but where canopy was retained (not required by the standard Rules), it was noted as "Other Features." A 500 foot long transect was the goal, but this was rarely achieved because of the way Class III watercourses occur on the landscape relative to timber management activities.

RESULTS AND DISCUSSION

Characteristics of Class III Watercourses Encountered

We expected an abundance of Class III watercourses to sample from in each THP. While a given THP generally has more Class III than Class I and II watercourses, we found that the relationship of Class III watercourses to timber management activities, and their position on the landscape, was quite different from that of Class I and II watercourses. In the THPs we sampled, we found that Class III watercourses typically occurred as shorter stream segments than did Class I and II watercourses. Class I and II watercourses typically occurred at the base of long slopes, with

timber management activity upslope and on one side of the stream, and with roads usually parallel to the stream. Class III watercourses more typically had timber management activities occurring through or on both sides of them, and roads typically occurred perpendicular —not parallel—to them. Class III watercourses in the coastal THPs we sampled typically occurred as short, very steep branches of Class I or II streams. In the THPs we sampled in the Sierra Nevada, Class III watercourses more typically graded into shallow swales without channels. It should be noted that the differences we found between watercourse classes are primarily a function of how timber harvest activities and roads are placed on the landscape, not necessarily how they occur on the landscape.

Field Sampling

We often found it difficult to sample more than 100 to 200 contiguous feet of Class III watercourse affected by the activities of a given THP. It was also often difficult to locate segments of Class III watercourses near a sample cluster consisting of one landing, skid road, road, and watercourse crossing. However, the Class III watercourses we sampled were generally uniform throughout their length, and the shorter transects appeared adequate for assessing the implementation and effectiveness of the Rules. A transect made along the middle of the designated Class III WLPZ or ELZ—same as transects made for Class II WLPZ—was usually adequate to observe effects of timber management activities throughout the WLPZ/ELZ as well as in the channel. ELZs are typically 25 or 50 feet wide, depending on slope, and harvest usually has removed enough timber to allow observations.

Field Forms

We developed a separate Class III field data form by modifying the existing WLPZ form. The tested field form was adequate for the transects we installed. However, after using the test form on several THPs, we found it so similar to the existing WLPZ form that another option became obvious— to modify the existing WLPZ form set to cover all WLPZs. Many Forest Practice Rules for Class III watercourses are already included in this form set.

Data Codes

We found the existing WLPZ data codes could be used on transects of Class III watercourses. The existing codes that will most commonly be used on Class III watercourses are:

SD (sediment accumulation; a positive feature in Class III, but negative in Class I and II)

CT (downed trees in or over channel)

ST (downed tree(s) on sideslope in WLPZ)

WS (skid trail located in WLPZ; this is allowable if designated as ELZ)

SC (skid trail used in WLPZ without approval in THP; also used with Class III watercourses for ground disturbance that is evidence of unapproved equipment use in an ELZ).

There are several other features that we either observed on Class III transects or that appear to be important in the management of Class III watercourses. Where encountered, we coded these items as OF (other features) in the pilot study. New codes are needed for the following features:

CR (canopy retention above what is required by Rules)

CD (channel downcutting; to be used only for Class III channels)

BD (duff burned to bare mineral soil *and* sediment delivered to or mobilized in channel)

BU (large woody material in channel burned *and* trapped sediment mobilized)

To the best of our knowledge, these proposed codes do not conflict with existing codes. However, to be sure, the database should be searched to assure there no conflicts.

Existing WLPZ codes for documenting the source, cause, and delivery of sediment from problem points, codes for relating problem points to THP activities, and codes to document Class III stream crossings are all adequate to provide the data needed to evaluate the implementation and effectiveness of FPRs related to Class III watercourses.

RECOMMENDATIONS

Feature Codes and Field Forms

We recommend the feature codes discussed above be added to the data set and further recommend that only one field form be used for all WLPZ transects. The existing WLPZ field data form can be readily modified to accept data for Class III watercourses. This approach will minimize the impact of modifying the existing database to accept Class III watercourse data. It will also simplify data entry for Class III watercourses.

Changes needed on the first page of the WLPZ form set are as follows (see the attached WLPZ field form set with recommended modifications and applicable questions/Rules identified):

Line 5, Stream class: delete "(if WLPZ)" after III

Insert line after line 5: "Protection Zone: WLPZ EEZ ELZ Other None

Add 2 lines below existing line 8 to read:

Road within existing EEZ (at any point on tnsct.)? Y N

Road within existing ELZ (at any point on tnsct.)? Y N

Add "NA" to each of the category descriptors for Habitat Type, Aquatic Habitat, Resources Supported, and Beneficial Use(s).

Add "Rule 916.4 (c) (1)" to Item 17 of the Implementation Evaluation Form set and modify question 17 to read "...the WLPZ/ELZ unless..." Questions and Rules already listed in the WLPZ Implementation Evaluation Form set that apply to Class III watercourses are: 1a, 1b, 1c, 2, 9, 10, 13, 15, 16, 17, 24, 25, 26, 30, and 31 (if designated as a WLPZ).

These are all the changes needed to adapt the existing WLPZ form set to accept field data from Class III watercourses.

Data Entry

The database has not yet been modified to accept data on Class III watercourses so data for the Class III watercourses sampled in 1999 has not been entered. If the existing WLPZ data form set is modified to accept field data from Class III transects as suggested above, we anticipate few problems with data entry and no conflict with data already entered.

Sampling Procedure

We recommend sampling two Class III watercourses (300 feet in length, if available) per THP. Class III watercourses should not be sampled unless a transect at least 100 feet long can be made. As with Class I and II watercourses, Class III watercourse transects are made as near the sample cluster consisting of one landing, road, skid road, and stream crossing as is practical.

This sampling procedure provides a reasonable balance in sampling Class I, II, and III watercourses; should be adequate to evaluate Rules that apply to Class III watercourses; and can be incorporated into the existing sampling scheme (clusters of one landing, road, skid road, crossing, and WLPZ) in a practical and cost-effective manner.

LITERATURE CITED

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